PROJECT facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
FEDERAL ENERGY TECHNOLOGY CENTER

ADVANCED CLEAN/EFFICIENT
POWER systems

PS019.0497

ADVANCED BYPRODUCT RECOVERY – CATALYTIC REDUCTION OF SO_2

PRIMARY PROJECT PARTNERS

Arthur D. Little
Cambridge, MA

Tufts University
Medford, MA

Engelhart Corporation
Engelhart, NJ

MAIN SITE

Arthur D. Little
Cambridge, MA

TOTAL ESTIMATED COST

$

COST SHARING

DOE	**$—**
Non-DOE	**$—**

Project Description

The first phase of this project will involve interviewing utilities, leading architect/engineering companies, regenerable sorbent producers and developers and industry consultants to define key issues and to focus the catalyst/byproduct recovery process research effort. The cost and benefits of the advanced byproduct recovery process will be evaluated and compared with those of state-of-the-art technologies. Issues that will be considered include compatibility with existing regenerable SO_2 removal processes, system contaminants, emission limitations, cost constraints and reliability/durability requirements. Market potential for the process will also be estimated. In addition, process and cost evaluations will be done.

These preliminary evaluations will be followed by catalyst development. This will involve preparing experimental catalyst formulations and characterizing the catalyst. Micro-reactor tests will be conducted to optimize the catalyst formulation. Candidate catalysts will be evaluated with respect to the effects of contaminants, stability and effectiveness.

Larger (bench scale) experiments will be carried out on the more promising candidates to determine the catalyst's durability, activity and selectivity. Work will then progress to the pilot scale (equal to the gas flow from a 0.5 megawatt unit) to obtain data under typical commercial conditions. A commercial design will be prepared and evaluated. A utility-scale demonstration plan will be prepared in conjunction with a selected electric utility.

Program Goal

?

Advanced Byproduct Recovery – Catalytic Reduction of SO_2

CONTACT POINTS

Janice Murphy
U.S. Department of Energy
Federal Energy Technology Center
Pittsburgh, PA
(412) 892-4512
(412) 892-4604 fax
murphy@fetc.doe.gov

Karen Benedek
Arthur D. Little
Cambridge, MA
(617) 498-6061

Project Benefits

Many flue gas desulfurization (FGD) processes, in use and being marketed today are non-regenerable which results in the production of calcium sulfide/sulfate solids in vast quantities. These solids present disposal problems so some process suppliers have modified their systems to produce a high-quality calcium sulfate which has some commercial use but vast markets haven't opened up. Ideally an FGD process should be regenerable and produce a high-value product. The most obvious choices are elemental sulfur or sulfuric acid, both of which are high value, large market products. However, due to high shipping costs sulfuric acid is generally produced relatively close to the large users. Thus, elemental sulfur is the preferred byproduct.

Both the Federal government and private industry have invested significant resources in the development of advanced, high efficiency, regenerable flue gas desulfurization (FGD) processes. These processes generally have a higher SO_2 removal than conventional FGD systems; often also remove NO_x with high efficiency; and produce little or no waste for landfill disposal. However, lack of a simple, cost-effective byproduct generation step has hampered commercialization of these advanced high-efficiency processes.

The technology to be developed will provide a simple, single-step, cost-effective solution to this problem: elemental sulfur will be produced from the regenerator off-gas by catalytic reaction with a reducing gas. The commercial embodiment of the proposed technology will lead to reduced capital and operating costs of regenerable FGD systems, permitting greater market penetration; reduced production of FGD wastes; and improved SO_2 and NO_x control due to increased use of advanced regenerable emissions control systems. In addition, the proposed technology will generate elemental sulfur, a high-value, utility-preferred byproduct for which there is a growing world market. There is no other sulfur recovery process, either commercial or under development, that will directly convert the various regenerable FGD off-gases to elemental sulfur with a reducing gas over a highly active and selective catalyst.

Cost Profile

(Dollars in Thousands)

	Prior Investment	FY95	FY96	FY97	Future Funds
Department of Energy*	$—	—	—	—	—
Private Sector Partners	$—	—	—	—	—

* Appropriated Funding

Key Milestones

FY94	FY95	FY96	FY97	FY98